DOCUMENT RESUME

ED 432 630 UD 033 045

AUTHOR Schwartz, Wendy

TITLE Family Math for Urban Students and Parents. ERIC/CUE Digest, Number 146.

INSTITUTION ERIC Clearinghouse on Urban Education, New York, NY.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
REPORT NO EDO-UD-99-6
ISSN ISSN-0889-8049
PUB DATE 1999-07-00
NOTE 4p.
CONTRACT ED-99-CO-0035
AVAILABLE FROM ERIC Clearinghouse on Urban Education, Institute for Urban and Minority Education, Box 40, Teachers College, Columbia University, New York, NY 10027; Tel: 800-601-4868 (Toll free).
PUB TYPE ERIC Publications (071) -- ERIC Digests in Full Text (073)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Cultural Awareness; Elementary Education; *Elementary School Students; Family Programs; Mathematics; *Mathematics Instruction; *Urban Schools; Urban Youth
IDENTIFIERS ERIC Digests; *Family Math

ABSTRACT

Family mathematics programs, based on family literacy programs, successfully teach math skills to both children and their parents. This digest describes specific strategies for teaching family mathematics. Schools can use these strategies as part of an overall program or as ad hoc family learning activities. In family math programs, program participants are considered to have a contract with each other in which the teacher plans and presents activities, and the parent and child work on them together. Family math program problems and experiments use situations and materials from everyday experience. Most effective family math programs include personal contact between teachers and parents, periodic group meetings for parents, resource rooms, family outings with learning opportunities, and different levels of group and home work. To be successful, family math programs must recognize cultural and language differences among families. (Contains 13 references.) (SLD)

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Family Math for Urban Students and Parents
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By Wendy Schwartz

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ERIC CLEARINGHOUSE ON URBAN EDUCATION

DIGEST

Number 146, July 1999 EDO-UD-99-6 ISSN 0889 8049

FAMILY MATH FOR URBAN STUDENTS AND PARENTS

Proficiency in higher mathematics, particularly algebra, is important for a good career. Unfortunately, though, girls and youth of color still lag behind white males in math achievement and even in enrollment in higher math courses. Further, many poor or immigrant adults did not have the opportunity to learn math; thus, they have limited job opportunities, cannot serve as models for their children, and may even fail to realize the value of mastering math.

Family math programs, based on family literacy programs, successfully teach basic math skills to both children and their parents. A variety of family programs, some of which even cover higher order math concepts, have been developed by organizations and implemented in urban schools. The most comprehensive is Family Math, created by the Lawrence Hall of Science in Berkeley, CA. In Great Britain, the IMPACT (Inventing Maths for Parents And Children And Teachers) program reaches thousands of families and is expanding throughout Europe. Other general math programs—such as the College Board's EQUITY 2000, which is focused on students of color and marketed to school districts—have a strong family involvement strand. Drawing on these and other programs, this digest describes specific strategies for teaching family math. Schools can employ them either as part of an overall program or as *ad hoc* family learning activities.

Program Organization

Principles

Family math programs are based on several beliefs:

- All children, regardless of sex, cultural background, or socioeconomic status, can learn higher mathematics.
- Students are more apt to learn when math is "real": when the curriculum is exciting, meaningful, based on personal experiences, and relevant to their lives.
- Math tasks are an integral part of daily life, and families can learn math together as they engage in their usual activities.

Program participants—teachers, parents, and students—are considered to have a contract with each other, whereby the teacher plans and presents math activities, and the parent and child work on them at home together. Participation in programs increases home-school cooperation and fosters parents' sense that the school can meet the needs of the whole family (Bobango & Milgram, 1993). Children benefit significantly from their parents' involvement; they appreciate the value of math more because their parents do and they have more chances to practice math (Hartog & Brosnan, 1994).

Content

Family math programs are problem solving in nature, requiring thought as opposed to answers based on memorization. They cover a wide range of concepts, from arithmetic and geometry to issues of probability, reasoning, and spatial visualization. They emphasize process rather than product in order to develop thinking skills and allay math anxiety and phobia that can result from the "one-way-one-solution" belief about math learning (Saarimaki, 1993; Stenmark, Thompson, & Cossey, 1986).

The most meaningful math curriculum presents problems using situations from real life and from a variety of cultures. Teachers explain exercises that may not be understandable to some families, thus providing an education in both math and multiculturalism. They show how knowledge of a variety of math skills can make daily life easier for families, when managing finances, shopping, or preparing meals (Bayliffe, Brie, & Oliver, 1993; Bobango & Milgram, 1993). Finally, programs show links between math proficiency overall and career success, and between mastery of certain mathematical concepts and specific careers. One career possibility that programs stress is math teaching (Anderson, 1996).

Materials and Resources

Family math program problems and experiments employ situations and materials from everyday experience. To further illustrate the value of math, neighborhood merchants are recruited to describe the use of math in their work.

Programs use models and hands-on materials (called "manipulatives") that allow participants to "feel" the problem as they solve it. Blocks, beans, pennies, and other concrete objects help students understand what numbers and space mean through visualization (Stenmark et al., 1986).

Increasingly, programs are also using electronic technology. Calculators keep track of lists of numbers that need to be added together. Computer spread sheets organize more complex problems that include multiple categories with many numbers assigned to each. Interactive math software programs are especially effective tools; families can solve related problems of increasing complexity simply by progressing through the program; they can develop a sense spatial relationships by manipulating graphics on the screen; and they can become proficient in "mental mathematics," a skill that will benefit them throughout the day. Further, learning with computers in groups induces attendance at family sessions, fosters cooperation, and increases the enjoyment in doing math (Harris, 1998; Bayliffe et al., 1993).

Structure

Most effective family math programs include the following (Border & Merttens, 1993):

- Personal contact between teachers and parents to discuss issues unique to the family and to assess learning progress.
- Periodic group meetings for parents that include an explanation of the curriculum; cooperative learning; training in use of the texts, workbooks, and manipulatives; a question-and-answer session; and an evaluation of progress.
- A room in the school with appropriate resources (including

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computers with math software) for family use.

- Family outings with learning opportunities.

Different types of family programs provide differing levels of learning intensity:

Group Work. Group sessions allow teachers to provide support and observe how families learn. They allow families access to resources not present at home, such as computers. And they foster a sense of community that encourages learning and cooperation (Bayliffe et al., 1993). Math learning sessions can be either stand-alone workshops that teach discrete math concepts and/or instruct parents in helping their children at home, or part of a sequenced learning series. Most are combined with at-home learning (Caldwell, 1989). In inner cities, intensive summer learning programs can be particularly effective; usually churches or organizations, such as local Urban League chapters, manage them.

Home Work. The most comprehensive programs set up a system of home study that includes provision of learning materials, a sequenced syllabus containing problems and games, and a mechanism for tracking progress (Hartog & Brosnan, 1994). Another model for home learning is a math learning packet to be used over the summer. To ensure that families do the activities together, math problems require interaction with parents in order to be solved. Ideally, parents attend a pre-summer meeting at which the packet is explained (Epstein & Herrick, 1991).

Recognition of Family Differences

Cultural Differences. As parents spend more time in the U.S., and as new generations become further removed from their native culture, their attitudes toward academic achievement in general, and math learning in particular, are likely to be no different from those of others. Therefore, program organizers guard against cultural stereotyping that can result in the elimination of some families from the recruiting process.

It may be true also, though, that immigrant or poor parents view schooling differently from educators. They may not understand why families should participate in children's learning, or why problem solving is a more effective way to learn than rote memorization. The competitive nature of Western education may clash with the values of some ethnic groups. Some parents may fear that they will fail at math as they did in the past. To allay concerns, organizers explain that family math is different from other courses parents may have taken and promise that they will be supported and will not be judged (Caldwell, 1989; Curle, 1993).

Language Differences. Several different ways of working with limited English proficient parents have been successful. Materials can be produced in several languages. Bilingual teachers can translate coursework during group sessions. Students fluent in English can translate lessons and problems and then work on them with their families in their home language. Older, English-fluent siblings can help younger children and their parents understand the lessons. Regardless of the method used, parents are reassured that teachers are not trying to undermine their ethnic identity (Caldwell, 1989; Curle, 1993).

Teacher Development

Two longstanding general educational goals are to increase the number of minority teachers and the number of teachers qualified to teach the math content specified in the National Council of Teachers of Mathematics' *Standards*. Training pre- and in-service teachers in family math can accomplish both goals. Further, using a culturally-diverse, gender-balanced teaching team demonstrates to participants that everyone can master math (Anderson, 1996).

Traditionally, math teachers do not expect or foster parent participation, as do, for example, reading teachers. Since doing so can increase student learning, teachers are trained to plan family math lessons, to work with parents, and, possibly, to overcome stereotypes that could impede their ability to form relationships with families (Epstein & Dauber, 1989).

One summer family math training program for teachers deals directly with ethnic issues. It encourages teachers to share feelings about their own experiences, including victimization from racism; and to discuss culturally-related educational issues such as tracking, bilingualism, and effectively teaching students with different learning styles (Allexsaht-Snider, 1996).

—Wendy Schwartz,
Teachers College, Columbia University

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This Digest was developed by the ERIC Clearinghouse on Urban Education, with funding from the Office of Educational Research and Improvement, U.S. Department of Education, under contract no. ED-99-CO-0035. The opinions in this Digest do not necessarily reflect the position or policies of OERI or the Department of Education.

ERIC Clearinghouse on Urban Education, Institute for Urban and Minority Education, Box 40, Teachers College, Columbia University, New York, NY 10027, (800) 601-4868. Erwin Flaxman, Director. Wendy Schwartz, Managing Editor.

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